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(54) System for the remote recognition and reading of meters

(57) System for the remote recognition and reading of meters to measure the consumption of utilities such as electric energy, water, gas, etc., used for remote communication between a metering unit and a reading device, the metering unit comprising at least a measuring device (15) associated with a device to emit pulses (16), the metering unit (11) comprising means (17) to acquire, process and transmit data connected at the inlet to the pulse-emitting device (16) and at the outlet to a transceiver unit (13), the transceiver unit (13) consisting of an unpowered passive component which can be activated for reception and/or transmission by means of a signal (28) emitted on a radio-frequency generated by a transceiver (25) associated with the reading device (12).

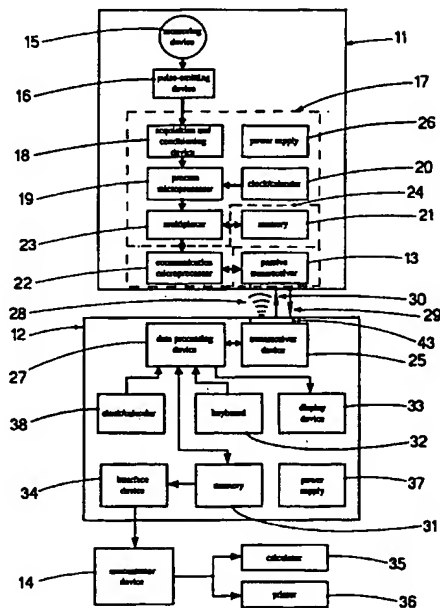


Fig.1

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## Description

The invention concerns a system for the remote recognition and reading of meters as set forth in the main claim.

To be more exact, the invention concerns a system for remote recognition and reading which can be applied in cases where there is a need to monitor the data measured by a wide variety of meters, whether or domestic or industrial use, such as for example meters for the consumption of electrical energy, water meters, gas meters, etc.

The state of the art covers those meters which are used to measure the consumption, either domestic or industrial, of utilities such as electricity, water, gas or other, which are suitable to display the total progressive consumption in the specific unit of measurement. These meters usually have a code to identify the apparatus which is generally printed on the containing structure; it is attributed to the user and is needed by the officials of the Utility companies in order to associate the displayed reading with the user concerned.

The data is read and transcribed onto registers, or input into the appropriate devices, and is then processed by the Utility company in order to issue the specific bill at the pre-established dates.

This system involves a great deal of manual work and therefore has various problems, which include: long execution times, possibility of errors, difficult access, difficulty in finding the meters etc. One example is water meters, which are generally located in underground pits, covered by heavy manholes, in dark places where dirt accumulates. All this causes problems, especially when the dirt accumulates on the part of the meter which is intended to be read and/or on the identification code which may also become illegible.

Another problem is that the meters are located on private property which is therefore only accessible when the user is present; in some cases the private property may be guarded by dogs, which may be a danger for the meter-reader.

Another risk for the meter-reader is when the meter is to measure toxic liquids, such as for example, industrial waste, or when the meter is located in contaminated industrial environments.

In the event that there are different tariffs for the different time bands, another problem is that the meters can only supply an average value because the display shows a progressive, total consumption, referring to a predetermined period of time.

With the reading systems such as are known to the state of the art, therefore, it is a problem to sub-divide and/or establish the amount consumed in the different periods of the year, for example summer and winter, or in the different time bands of the day, for example day and night; the Utility companies therefore find it difficult to apply tariffs which are differentiated according to different time bands and periods of time, and therefore to

apply the higher rates to the users for peak time use.

Systems have been studied which are able to read the meters from a distance in order to overcome these shortcomings.

These systems are based on the use of transmitters and receivers using a radio-frequency; however, they involve a series of problems such as: the need to use specific aerials, the danger that the transmissions are affected by electrical or electronic disturbances in general, the need to locate the meters in places suitable for the transmission of radio-frequencies and therefore, in the majority of cases, it is impossible to utilise those sites already used by meters of a conventional type.

The present applicants have designed, tested and embodied this invention to overcome the shortcomings of the state of the art and to achieve further advantages.

The invention is set forth and characterised in the main claim, while the dependent claims describe variants of the idea of the main embodiment.

The purpose of the invention is to provide a system for the remote recognition and reading of meters which is able to perform conventional reading operations automatically.

Another purpose of the invention is to obtain a system able to perform remote operations of reading and/or writing using a transceiver device which, while it is working, does not need its own source of power and works on a low frequency.

A further purpose of the invention is to acquire, at a distance and automatically, a plurality of supplementary data such as, for example, consumption according to the different time bands, the date of installation and last reading, the serial numbers attributed by the builder and/or the Utility company or other data according to the specific applications to which the meter is intended.

A further purpose is to obtain a system which is reliable, versatile, long-lasting, ergonomic, inexpensive and easy to use.

The recognition and reading system according to the invention substantially comprises a metering unit and a reading device which communicate to each other by means of low frequency transmissions.

The metering unit consists of a measuring device of a conventional type associated with a device suitable to emit pulses correlated to the measurements monitored, and of a device to acquire, process and transmit data, installed directly in cooperation with the measuring device.

The device to acquire, process and transmit data receives the pulses as input, processes them and emits as output numerical data relating to the readings, as well as other possible information, such as for example temporal information relating to the readings. The numerical data can be associated and/or integrated with supplementary and/or auxiliary information such as for example, a code, a serial number, the date of installation of the metering unit, etc.

According to the invention, the device to acquire,

process and transmit data cooperates at least with a passive transceiver unit, that is, to say, of the type which does not require its own power supply while it is working, which is able to exchange data on a low frequency with a transceiver on the reading device.

According to the invention, the transceiver unit installed on the meter, when it is activated by a radio-frequency field, for example generated by the transceiver on the reading device, is able to transmit and/or receive the data memorised in the metering unit.

Using a transceiver unit of this type gives a plurality of advantages: it is not necessary to supply a source of power, and therefore it can function in any site or position whatsoever; it is possible to transfer data through non conductor materials, it is unaffected by atmospheric agents and the accumulation of dirt, it can be adapted to various forms and sizes.

According to a variant, the passive transceiver unit is located in a position which is far from the metering unit and therefore more easily identifiable and accessible for the meter-readers.

According to the invention, the reading device comprises means suitable to generate a radio-frequency field to activate and feed the transceiver unit associated with the metering unit and to allow data to be exchanged. The reading device moreover may have devices to acquire and process data, devices to memorise data and possibly devices to transmit data, for example to a central data and pricing bank.

The reading device is of the portable type and can be carried by the meter-readers.

According to a variant, the reading device is of the stationary type and associated with the metering unit.

The stationary reading device can be connected, possibly together with similar reading devices associated with other metering units, to a concentrator device associated in turn with a local processing unit which can communicate and transmit data, for example by means of a modem, to a central data processor.

According to this variant, the readings are carried out according to commands issued by the central data processor, for example located in a central data bank, to the local processor situated, for example, in an area with a plurality of users.

The attached Figures are given as a non-restrictive example and show some preferred embodiments of the invention as follows:

Fig. 1 shows a functional diagram of the system to recognise and read meters according to the invention;

Fig. 2 shows in diagram form a possible embodiment of the invention.

The recognition and reading system 10 according to the invention consists, in this case, of a metering unit 11, a reading device 12 and a concentrator device 14.

The metering unit 11 comprises a measuring

device 15 of a conventional type, installed on the duct of the utility to be measured, associated with a pulse-emitting device 16, a device to acquire, process and transmit data 17 and a passive transceiver 13.

The pulse-emitting device 16 consists of a transducer able to generate a series of pulses directly proportional to the measurements made by the measuring device 15.

The pulses are sent to an acquisition and conditioning device 18 which adapts them so that a process microprocessor 19 can obtain a series of numerical data relating to the measurements made by the device 15.

Thanks to the clock/calendar 20, this data contains information conditioned by the variations in time; therefore the data referring to the measurements can be classified, for example, according to the different time bands or periods of time.

The data is memorised in a memory 21 which is also shared by a communication microprocessor 22 by means of a multiplexer 23.

The communication microprocessor 22 is suitable to manage the functioning of the passive transceiver 13; that is to say, it makes it possible to transfer to the passive transceiver 13 the data memorised in the memory 21 and/or to acquire the data arriving in the passive transceiver 13 and transfer it to the memory 21.

In a preferential embodiment of the invention, the passive transceiver 13 is integrated in an apparatus, known as a transponder 24, (shown in Fig. 1 by a line of dots and dashes), which brings together the communication microprocessor 22 and the memory 21; this apparatus makes it possible to communicate at a distance and without contact with a transceiver device 25 associated with the reading device 12.

The passive transceiver 13 does not need its own sources of power; the devices 18-23 on the contrary are associated with a source of power 26, for example, a long-life battery.

The transceiver unit 25 is suitable to transmit a radio-frequency signal 28 which activates the passive transceiver 13 and feeds it throughout its period of functioning.

Once it has been activated by the radio-frequency field, the passive transceiver 13 is able to transmit the data 29 contained in the memory 21 and, at the same time, it can receive the data 30 which the meter-reader transfers from the reading device 12 and then transfer it to the memory 21.

The data 29 received from the reading device 12 is processed by a processing device 27 which memorises it in a memory 31.

The operations to read and/or transmit data is carried out by the meter-reader, in this case by means of the keyboard 32; a display device 33 makes it possible to verify the performance of the above operations and/or the display of further information.

The interface device 34, by means of the appropriate connection, transfers the data contained in the memory 31 to a concentrator device 14, which is suitable to collect the data from one or more reading devices 12 and can, in turn, be connected to a calculator 35 or to a printer 36.

The reading device 12 comprises feeding means 37, for example consisting of rechargeable batteries, and can include a clock/calender 38, for example to verify and/or update the working of the clock/calendar 20 in the metering unit 11 and, possibly, to modify the pricing parameters.

Fig. 2 shows a diagram of a possible embodiment of the invention with a portable reading device 12.

On the outer surface of the containing structure of the reading device 12 there is a keyboard 32, a display 33, a connection device 39 to connect with the appropriate battery-charging devices, an aerial 43 for the transmission-reception of data and a connection device 40 to transfer the data which has been read to a concentrator device 14.

The metering unit 11 comprises a conventional measuring device 15 associated with a passive transceiver, in this case integrated into the transponder 24, which has the aerial 42 cooperating with the outer surface of the metering unit 11.

The system to recognise and read meters thus achieved provides for the following procedure: the meter-readers, equipped with the reading device 12, position themselves with respect to the metering unit 11 at a distance 44 such that the transponder 24 is activated by the generation of a radio-frequency field.

The operations to read the data and/or the inputting of the data to be transmitted are carried out by means of the keyboard 32; by means of the display 33 it is possible to verify the results of the readings carried out and/or to display other information, such as for example, the number of readings carried out, the state of charge of the battery, etc.

At the conclusion of the readings carried out on one or more metering units 11, the reading device 12 is introduced into the housing seating 41 of the concentrator device 14 and the data memorised in the reading device 12 are transferred by means of the connection device 40 to the concentrator device 14.

The concentrator device 14 is able to manage and/or process the data collected and interface with a calculator 35 and with a printer 36 to process the data, for example operations to issue bills automatically.

#### Claims

1. System for the remote recognition and reading of meters to measure the consumption of utilities such as electric energy, water, gas, etc., used for remote communication between a metering unit and a reading device, the metering unit comprising at least a measuring device (15) associated with a

device to emit pulses (16), the system being characterised in that the metering unit (11) comprises means (17) to acquire, process and transmit data connected at the inlet to the pulse-emitting device (16) and at the outlet to a transceiver unit (13), the transceiver unit (13) consisting of an unpowered passive component which can be activated for reception and/or transmission by means of a signal (28) emitted on a radio-frequency generated by a transceiver (25) associated with the reading device (12).

2. System as in Claim 1, in which the means (17) to acquire, process and transmit data comprise an acquisition and conditioning unit (18) connected at the inlet with the pulse-emitting device (16) and at the outlet with a memory (21) associated with the transceiver (13) by means of a communication microprocessor (22).
3. System as in claim 1 or 2, in which the transceiver (13), the communication microprocessor (22) and the memory (21) are integrated into a single component (transponder) (24).
4. System as in claim 1 or 2, in which the transceiver unit (13) is of the reading-only type and is suitable to transmit the data contained in the memory (21) to the reading device (12).
5. System as in claim 1 or 2, in which the transceiver unit (13) is of the reading and writing type and is suitable to receive data from the reading device (12), to transfer data to the memory (21) and to transmit data to the reading device (12).
6. System as in any claim hereinbefore, in which the means (17) to acquire, process and transmit data comprise a clock/calender (20) connected to the acquisition and conditioning unit (18).
7. System as in any claim hereinbefore, in which the reading device (12) is of the portable type.
8. System as in any claim from 1 to 6 inclusive, in which the reading device (12) is of the stationary type and is associated with the metering unit (11).
9. System as in any claim hereinbefore, in which the reading device (12) comprises means (32) to introduce the data, display means (33), memory means (31) and data processing means (27) connected to the transceiver unit (25).
10. System as in any claim hereinbefore, in which the reading device (12) comprises interface means (34) and connection means (40) with a concentrator device (14) which can be connected with a plurality

of reading devices (12).

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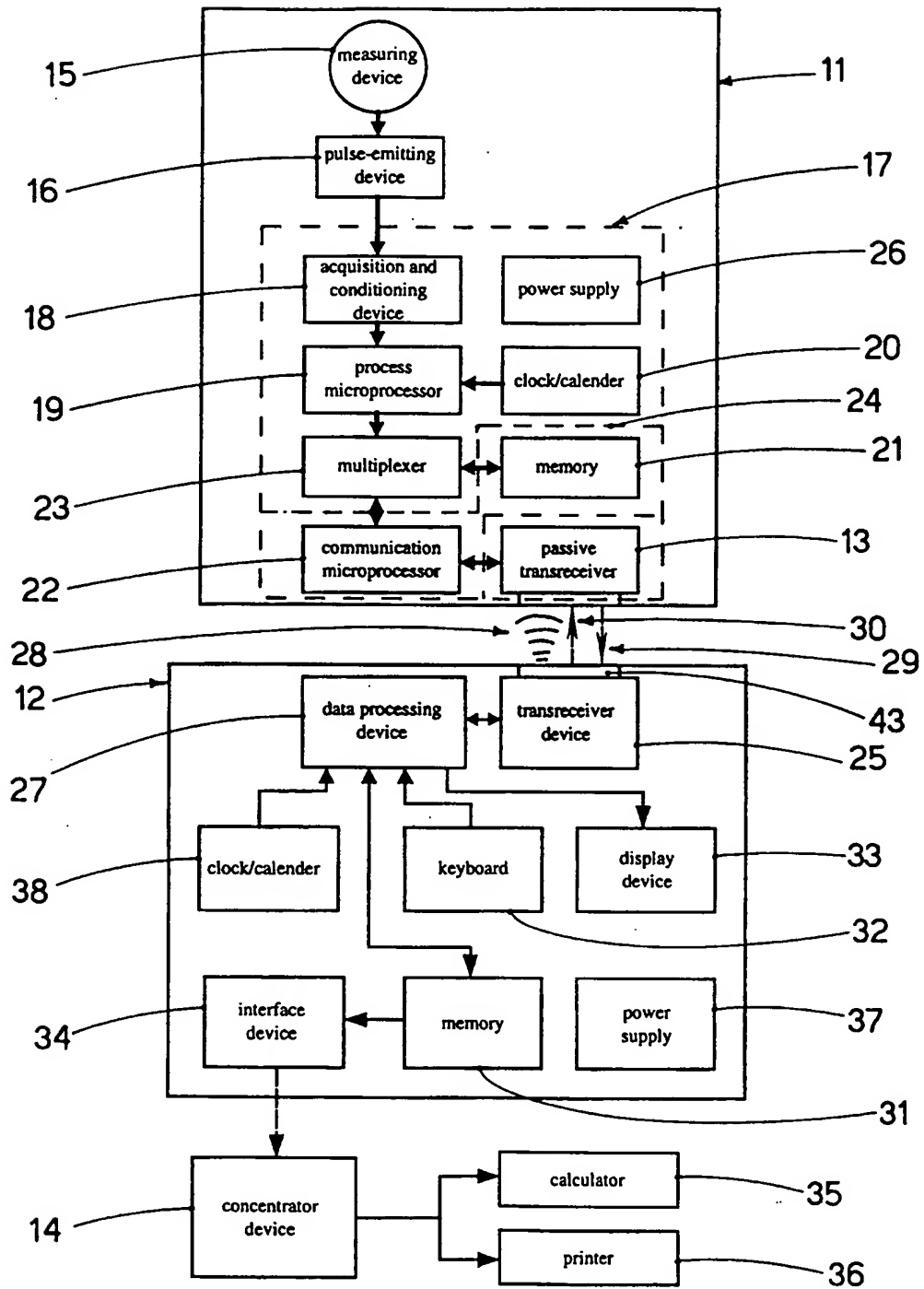


fig.1

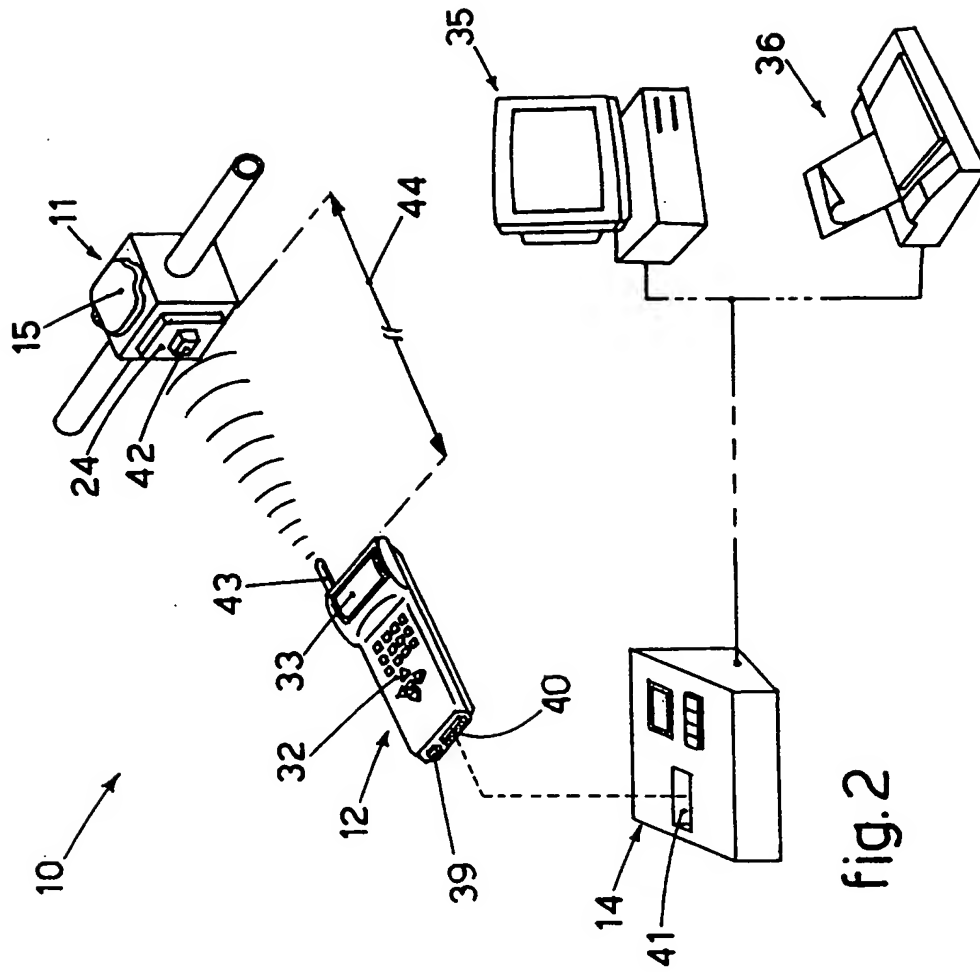


fig.2



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## EUROPEAN SEARCH REPORT

Application Number  
EP 97 11 3140

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB 2 138 609 A (EMI LIMITED) * the whole document *	1,4,7	G08C17/02
Y	---	2,3,5,6, 8-10	
Y	GB 2 278 699 A (LOGICA UK LTD) 7 December 1994 * page 13, line 18 - page 14, line 7; claims 1,6,12; figures 1,12 *	2,3,5,6	
Y	WO 95 27273 A (BELL DAVID) 12 October 1995 * page 7, line 6 - line 37; figure 1 *	8	
Y	WO 93 19439 A (BROWN BOVERI KENT LTD) 30 September 1993 * page 3, line 20 - page 4, line 20; figure 1 * * page 7, line 11 - line 15 *	9,10	
A	EP 0 457 306 A (GAS ELEKTRIZITAETS UND WASSERW) 21 November 1991 * claims 1-3 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	GB 2 268 032 A (BADGER METER INC.) * page 4, line 1 - line 11; figure 1 *	1	G08C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10 October 1997	Examiner Wanzeele, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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